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Technical Safety Requirements for the Gamma Irradiation Facility (GIF)

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Hot Cells & Gamma Facilities Department

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ABSTRACT

The Technical Safety Requirements (TSR) document is prepared and issued in compliance with DOE Order 5480.22, Technical Safety Requirements. The bases for the TSR are established in the GIF Safety Analysis Report issued in compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports. The TSR identifies the operational conditions, boundaries, and administrative controls for the safe operation of the facility.

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CONTENTS

<u>Section</u>	<u>Title</u>	<u>Page</u>
INTRODUCTION		7
1 USE AND APPLICATION		9
1.1	DEFINITIONS AND ACRONYMS	11
1.2	FREQUENCIES	14
2 SAFETY LIMITS		15
3/4 OPERATIONAL LIMITS AND SURVEILLANCE REQUIREMENTS		19
3.0	GENERIC LIMITING CONDITIONS FOR OPERATION (LCO)	21
4.0	GENERIC SURVEILLANCE REQUIREMENTS (SR)	22
3/4.1	LIMITING CONTROL SETTINGS	23
3/4.2	LIMITING CONDITIONS FOR OPERATION (LCO)	23
3/4.2.1	Cell Source Elevator Power Interrupt Circuit	23
3/4.2.2	Cell Radiation Area Monitor	25
5 ADMINISTRATIVE CONTROLS		27
5.1	Purpose	29
5.2	Technical Safety Requirements	29
5.2.1	General Requirements	29
5.2.2	Compliance	29
5.2.3	TSR Violations	29
5.2.4	Response to a TSR Violation	29
5.2.5	Conditions Outside TSRs	30
5.3	Management Organization	30
5.4	Management Responsibilities	30
5.5	Procedures	30
5.6	Programs	31
5.6.1	Radiation Protection Program	31
5.6.2	Industrial Safety, Industrial Hygiene, and Fire Protection Programs	31
5.6.3	Conduct of Operations Program	31
5.6.4	Maintenance Program	31
5.6.5	Configuration Management Program	32
5.6.6	Criticality Safety Program	32
5.6.7	Emergency Preparedness Program	32
5.6.8	Quality Assurance Program	32
5.7	Minimum Operations Shift Complement	33
5.8	Operating Support	33
5.9	Staff Qualifications and Training	33
5.10	Experiment Safety	33
5.11	TSR Basis Control	34
5.12	Review/Audits	34
5.13	Reporting Requirements	35
5.14	Other Worker Safety Controls	35
5.14.1	Radiation Monitoring System	35
5.14.2	Radioactive and Fissile Material Limits	35
5.14.3	Combustible and Flammable Material Limits	36
5.14.4	Sealed Sources	36
5.14.5	Irradiation Cell Shielding	36
5.14.6	Source Transfer Cask	37
5.14.7	Source Storage Pool Water Level	37
APPENDIX A	BASES	
APPENDIX B	DESIGN FEATURES	

LIST OF TABLES

<u>Table Number</u>	<u>Title</u>	<u>Page</u>
1.1-1	Modes	14

TECHNICAL SAFETY REQUIREMENTS

for the GAMMA IRRADIATION FACILITY (GIF)

INTRODUCTION

This document provides the Technical Safety Requirements (TSR) for the Sandia National Laboratories Gamma Irradiation Facility (GIF). The TSR is a compilation of requirements that define the conditions, the safe boundaries, and the administrative controls necessary to ensure the safe operation of a nuclear facility and to reduce the potential risk to the public and facility workers from uncontrolled releases of radioactive or other hazardous materials. These requirements constitute an agreement between DOE and Sandia National Laboratories management regarding the safe operation of the Gamma Irradiation Facility.

This document is consistent with the guidance provided in Attachment 1 of DOE Order 5480.22 and the DOE Defense Programs Document of Example Technical Safety Requirements. Section 1, "Use and Application," contains basic information and instructions for using and applying the TSR. Section 2, "Safety Limits," addresses applicable limits on important process variables. (Note that there are no safety limits and hence, no limiting control settings applicable to GIF operations.) Section 3/4, "Operational Limits and Surveillance Requirements," addresses applicable Limiting Control Settings and Limiting Conditions for Operation, as well as applicable Modes, Action Statements, and Surveillance Requirements associated with each limit. Section 5, "Administrative Controls," addresses the programmatic and other commitments that are necessary to 1) ensure the underlying assumptions in the TSR Bases are valid, 2) provide for worker safety/defense in depth, and 3) effectively manage operational safety. Appendix A, "Bases for the Technical Safety Requirements," provides the rationale underlying the various TSR controls. Finally, Appendix B, "Design Features," provides a listing of the design features that either preclude or reduce the potential consequences of design basis accidents.

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SECTION 1
USE AND APPLICATION

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1.1 DEFINITIONS AND ACRONYMS

The defined terms of this section appear in capitalized type and are applicable throughout these technical safety requirements and bases.

<u>Term</u>	<u>Definition</u>
ACTION(S)	An ACTION(S) SHALL be that part of a Technical Safety Requirement (TSR) that prescribes required actions to be taken under designated conditions within specified completion times.
BYPASS KEY	A key that is administratively controlled by the GIF Department Manager and used to actuate a key switch on the cell operations console that allows the cell RAM or cell elevator interlock to be bypassed for the purpose of performing maintenance or repair activities inside an irradiation cell.
CALIBRATE	A quantitative verification and/or adjustment of a channel such that its output corresponds with acceptable accuracy to known values of the parameter which the channel measures.
DOUBLE CONTAINMENT	An EXPERIMENT arrangement in which the enclosure containing EXPERIMENT material is completely contained within a second enclosure.
ENSURE	To ENSURE is to confirm and substantiate that an activity or condition has been implemented in conformance with specified requirements. Manipulation of equipment or instrumentation to conform with the specified requirement <u>is</u> permitted. Methods other than direct observation may be used.
EXPERIMENT	Any apparatus, device, or material placed in the vicinity of radioactive sources for the purpose of being irradiated.
HAZARDOUS MATERIAL	HAZARDOUS MATERIAL means any solid, liquid, or gaseous Material that is toxic, explosive, flammable, corrosive, or otherwise physically or biologically threatening to health. Hydraulic fluid, mineral oil, and vacuum pump oils are excluded from this definition.
IMMEDIATELY	IMMEDIATELY is used as a completion time when a condition cannot be permitted to continue and the required action must be initiated without delay and continued until it is completed.
IN-SERVICE	A system, subsystem, train, component, or device SHALL be IN-SERVICE when it is in place <u>and</u> performing its specified function(s).
MODE	A MODE SHALL correspond to any combination of facility condition, pressure, temperature, etc., specified in Table 1.1-1.

1 USE AND APPLICATION

OPERABLE/ OPERABILITY	A system, subsystem, train, component, or device SHALL be OPERABLE or have OPERABILITY when it is capable of performing its intended function(s), and support equipment required for the system, subsystem, train, component, or device to perform its safety function is also capable of performing its intended function(s).
OPERATING	A system, subsystem, train, component, or device is OPERATING when it is performing its intended function(s).
RADIOACTIVE MATERIAL	Any material that undergoes radioactive decay.
SEALED	A radioactive material used for the purpose of irradiation and sealed in a
SOURCE	capsule strong enough to prevent contact with and dispersion of the material under the conditions of use and wear for which it was designed.
SHALL	Denotes a requirement.
SINGLE	A full enclosure that limits the release of contained material and stored
CONTAINMENT	Energy within the material to acceptable limits.
VERIFY	To VERIFY is to confirm and substantiate that an activity or condition has been implemented in conformance with the specified requirements. Manipulation of equipment or instrumentation to conform with the specified requirement <u>is not</u> permitted. Methods other than direct observation may be used.

Acronyms

AC	Administrative Controls
ALARA	As Low As Reasonably Achievable
CSA	Criticality Safety Assessment
DOE	Department of Energy
ES&H	Environment, Safety & Health
GIF	Gamma Irradiation Facility
LCO	Limiting Condition for Operation
LCS	Limiting Control Setting
MIP	Maintenance Implementation Plan
NFSC	Nuclear Facilities Safety Committee
PSO	Program Secretarial Officer
RAM	Radiation Area Monitor
RCSC	Radiological & Criticality Safety Committee
RPPM	Radiological Protection Procedures Manual
SAR	Safety Analysis Report
SL	Safety Limit
SNM	Special Nuclear Material
SOP	Standard Operating Procedure
SR	Surveillance Requirement
TA-V	Technical Area V
TSR	Technical Safety Requirements

Table 1.1-1 Modes

MODE	TITLE	DESCRIPTION
1	CELL IRRADIATION OPERATION ^(a)	Normal cell irradiation activities are being performed. Movement and handling of radioactive SEALED SOURCES and material is permitted.
2	CELL STANDBY ^(a)	Movement of SEALED SOURCES into the cell is <u>not</u> permitted. The cell elevator must be fully down. Movement of SEALED SOURCES in the pool is permitted. Movement of other RADIOACTIVE MATERIAL in the facility is permitted.
3	CELL MAINTENANCE ^{(a)(b)}	Elevator movement is permitted with SEALED SOURCES removed from the elevator. Handling and movement of SEALED SOURCES in areas undergoing maintenance is not permitted. RADIOACTIVE and HAZARDOUS MATERIALS have been removed from any area undergoing maintenance.
4	SHUTDOWN ^(b)	No operations activities, including movement and handling of radioactive SEALED SOURCES, are permitted in the facility. The cell elevators must be fully down and no handling or movement of RADIOACTIVE MATERIAL is permitted in the facility.
(a) These modes are applicable to each irradiation cell individually. Movement of sources in the pool and in-pool and low dose irradiation operations are permitted.		
(b) Use of the operations console BYPASS KEY is permitted only in these modes and with no sources on the cell elevator.		

1.2 FREQUENCIES

PURPOSE	The purpose of this section is to define the proper use and application of frequency requirements. Each surveillance requirement (SR) has a specified frequency that must be met in order to meet the associated LCO.
FREQUENCY	The frequency notations, as used in the surveillances and elsewhere
NOTATION	in this document, are defined as follows.

<u>Notation</u>	<u>Symbol</u>	<u>Minimum Frequency</u>
Quarterly	Q	At least once every 92 days
Semi-annually	SA	At least once every 184 days
Annually	A	At least once every 365 days

Note: Application of generic surveillance requirement SR 4.02 (see Section 4.0) SHALL be in accordance with these definitions.

SECTION 2
SAFETY LIMITS

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2 SAFETY LIMITS

2.0 SAFETY LIMITS (SL)

There are no safety limits applicable to Gamma Irradiation Facility operations.

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SECTIONS 3 AND 4
OPERATIONAL LIMITS AND SURVEILLANCE REQUIREMENTS

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3.0 GENERIC LIMITING CONDITIONS FOR OPERATION (LCO)

- 3.0.1 LCOs SHALL be met during the MODES or other specified conditions in the applicability statement, except as provided in LCO 3.0.2.
- 3.0.2 Upon discovery of a failure to meet an LCO, the associated ACTION(S) SHALL be met. If the LCO is restored before the specified completion time(s) expires, completion of the ACTION(S) is not required, unless otherwise stated.

- 3.0.3 When an LCO is not met, and the associated ACTION(S) are not met or an associated ACTION(S) is not provided, the facility SHALL be placed in MODE 2, or another specified condition. This requirement SHALL be initiated within one (1) hour, and completed within the next 2 hours.

Where corrective measures are completed that permit operation in accordance with the LCO or ACTION(S), completion of the ACTION(S) required by LCO 3.0.3 is not required.

LCO 3.0.3 is applicable to all MODES. Exceptions to LCO 3.0.3 may be stated in the individual LCOs.

- 3.0.4 When an LCO is not met, a MODE or other specified condition in the applicability statement SHALL not be entered, except when the associated ACTION(S) to be entered permit continued operation in the MODE or other specified condition in the applicability statement for an unlimited period of time. LCO 3.0.4 SHALL not prevent changes in MODES or other specified conditions in the applicability statement that are required to comply with ACTION(S).

Exceptions to LCO 3.0.4 are stated in the individual LCOs. When an individual LCO states that LCO 3.0.4 does not apply, then it allows entry into MODES or other specified conditions in the applicability statement when the associated ACTION(S) to be entered permit operation in the MODE or other specified condition for only a limited time.

- 3.0.5 Equipment removed from service or declared inoperable to comply with ACTION(S) may be returned to service under administrative control solely to perform testing required to demonstrate its OPERABILITY or the OPERABILITY of other equipment. This is an exception to LCO 3.0.2 for the system returned to service under administrative control to perform the testing required to demonstrate OPERABILITY.
- 3.0.6 When a support system is inoperable and an LCO for that support system is specified in the TSRs, the supported system is not required to be declared inoperable due solely to support system inoperability. Only the support system's ACTION(S) are required to be entered. This is a clarification of the definition of OPERABILITY. LCO 3.0.2 is still applicable to the supported system.
- 3.0.7 Entry into a MODE or other specified condition in the applicability statement for which a LCO is not met SHALL be permitted for the sole purpose of satisfying a Surveillance Requirement, but only with the use of administrative controls for which appropriate compensatory actions are specified. This provision is an exception to LCOs 3.0.1 and 3.0.4.

4.0 GENERIC SURVEILLANCE REQUIREMENTS (SR)

- 4.0.1 SRs SHALL be met during the MODES or other specified conditions in the applicability statement for individual LCOs unless otherwise stated in the SR. Failure to meet a surveillance (whether such failure is experienced during the performance of the surveillance or between performances of the surveillance) SHALL constitute failure to meet the LCO statement. Failure to perform a surveillance within the specified frequency SHALL constitute failure to meet the LCO statement, except as provided in SR 4.0.3. Surveillances do not have to be performed on inoperable equipment.
- 4.0.2 The specified frequency for each SR is met if the surveillance is performed within 1.25 times the interval specified in the frequency, as measured from the previous performance or as measured from the time a specified condition of the frequency is met.
- 4.0.3 If it is discovered that a surveillance was not performed within its specified frequency, compliance with the requirement to declare the LCO statement not met may be delayed from the time of discovery up to 24 hours or up to the limit of the specified frequency, whichever is less. This delay period is permitted to allow performance of the surveillance.

If the surveillance is not performed within the delay period, the LCO statement SHALL IMMEDIATELY be declared not met, and the applicable ACTION(S) SHALL be entered. The completion times of the ACTION(S) begin IMMEDIATELY on expiration of the delay period. When the surveillance is performed within the delay period and the surveillance is not met, the LCO SHALL IMMEDIATELY be declared not met, and the applicable ACTION(S) SHALL be entered. The completion times of the ACTION(S) begin IMMEDIATELY on the failure to meet the surveillance.

- 4.04 Entry into a MODE or other specified condition in the applicability statement of an LCO SHALL not be made unless the LCO's surveillances have been met within their specified frequency. This provision SHALL not prevent passage through or to MODES or other specified conditions in compliance with ACTION(S).
- 4.0.5 If a SR cannot be performed except by entry into a MODE or other specified condition in the applicability statement of an LCO for which satisfaction of the SR is required, then entry into the MODE SHALL be permitted for the sole purpose of performing the SR, but only with the use of administrative controls for which appropriate compensatory actions are specified. This provision is an enhancement to SRs 4.0.1, 4.0.3, and 4.0.4.

3/4.1 LIMITING CONTROL SETTINGS (LCS)

This section is not applicable to Gamma Irradiation Facility operations since there are no safety limits.

3/4.2 LIMITING CONDITIONS FOR OPERATION (LCO)

3/4.2.1 Cell Source Elevator Power Interrupt Circuit

LCO: The cell source elevator power interrupt circuit, consisting of the following equipment for each cell, SHALL be OPERABLE:

- one safety switch mounted on each cell door frame that de-energizes the source elevator brake;
- one safety switch mounted on each cell door frame that de-energizes the source elevator motor contactor;
- one safety switch mounted on the stationary mating large cell wall that de-energizes both large cell source elevator brakes;
- one safety switch mounted on the stationary mating large cell wall that de-energizes both large cell source elevator motor contactors;
- an emergency stop switch on each cell operations control console that de-energizes both the source elevator brake and motor contactor.

APPLICABILITY: MODE 1

ACTIONS:

Condition	Required Action	Completion Time
Cell source elevator power interrupt circuit safety switch inoperable	Place the cell in MODE 2	IMMEDIATELY
	<u>AND</u> Restore switch to OPERABLE	Before entering MODE 1
Cell operations console emergency stop switch inoperable	Place the cell in MODE 2	IMMEDIATELY
	<u>AND</u> Restore switch to OPERABLE	Before entering MODE 1

SURVEILLANCE REQUIREMENTS:

SR#	Surveillance	Frequency
4.2.1.1	With the cell elevator brake energized, VERIFY that opening the appropriate cell door safety switch de-energizes the brake.	Semi-annually
4.2.1.2	With the cell elevator motor contactor energized, VERIFY that opening the appropriate cell door safety switch de-energizes the motor contactor.	Semi-annually
4.2.1.3	With the cell elevator brake(s) energized, VERIFY that activating the emergency stop switch on the cell operations console de-energizes the brake(s).	Semi-annually
4.2.1.4	With the cell elevator motor contactor(s) energized, VERIFY that activating the emergency stop switch on the cell operations console de-energizes the motor contactor(s).	Semi-annually
4.2.1.5	With the cell in elevator bypass and with the cell elevator brake(s) energized, VERIFY that activating the emergency stop switch on cell operations console de-energizes the brake(s).	Semi-annually
4.2.1.6	With the cell in elevator bypass and with the cell elevator motor contactor(s) energized, VERIFY that activating the emergency stop switch on the cell operations console de-energizes the motor contactor(s).	Semi-annually
4.2.1.7 (Cell 3 elevators)	With cell elevator brakes energized, VERIFY that opening the appropriate moveable wall safety switch de-energizes the brakes.	Semi-annually
4.2.1.8 (Cell 3 elevators)	With cell elevator motor contactors energized, VERIFY that opening the appropriate moveable wall safety switch de-energizes the motor contactors.	Semi-annually
4.2.1.9 (Cell 3 elevators)	With cell elevator brakes energized, VERIFY that activating the emergency stop switch on the moveable wall control console de-energizes the brakes.	Semi-annually
4.2.1.10 (Cell 3 elevators)	With cell elevator motor contactors energized, VERIFY that activating the emergency stop switch on the moveable wall control console de-energizes the motor contactors.	Semi-annually
4.2.1.11 (Cell 3 elevators)	With the cell in elevator bypass and with both cell elevator brakes energized, VERIFY that activating the emergency stop switch on the moveable wall control console de-energizes the brakes.	Semi-annually
4.2.1.12 (Cell 3 elevators)	With the cell in elevator bypass and with both cell elevator motor contactors energized, VERIFY that activating the emergency stop switch on the moveable wall control console de-energizes the motor contactors.	Semi-annually
4.2.1.13	VERIFY that each source elevator descends to the bottom of the source storage pool when the emergency stop switch on the cell operations console is activated.	Semi-annually

3/4 OPERATIONAL LIMITS AND SURVEILLANCE REQUIREMENTS

3/4.2.2 Cell Radiation Area Monitor

LCO: The cell Radiation Area Monitor (one per cell) and its associated visual alarm (rotating beacon) inside the cell entrance maze SHALL be OPERABLE. The visual alarm SHALL be activated by a dose rate no higher than 100 mR/hr.

APPLICABILITY: MODES 1 and 2

ACTIONS:

Condition	Required Action	Completion Time
Cell RAM inoperable	Place the cell in MODE 3 <u>AND</u> Restore RAM to OPERABLE	IMMEDIATELY Before facility operation in MODE 1 or before personnel entry in MODE 2
Cell visual alarm inoperable	Place the cell in MODE 3 <u>AND</u> Restore visual alarm to OPERABLE	IMMEDIATELY Before facility operation in MODE 1 or before personnel entry in MODE 2

SURVEILLANCE REQUIREMENTS:

SR#	Surveillance	Frequency
4.2.2.1	VERIFY cell RAM and visual alarm OPERABILITY	Prior to the first cell entry of the day or per SR 4.0.5.
4.2.2.2	VERIFY cell RAM alarms visually at a setpoint no higher than 100 mR/hr by performing a source check	Quarterly
4.2.2.3	CALIBRATE cell RAM	Annually

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SECTION 5
ADMINISTRATIVE CONTROLS

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5 ADMINISTRATIVE CONTROLS

5.1 PURPOSE

The purpose of the administrative controls (AC) is to delineate the provisions relating to organization and management, procedures, record keeping, review and audit, reporting, and safety-control programs necessary to ensure safe operation of the Gamma Irradiation Facility so that it complies with the Technical Safety Requirements (TSR).

5.2 TECHNICAL SAFETY REQUIREMENTS

5.2.1 General Requirements

The TSRs SHALL be approved by the Department of Energy (DOE) and administratively controlled. Proposed changes to the TSRs SHALL be prepared with a submittal package that includes a description of, and justification for, the change together with any supporting analyses. Following internal review and approval, proposed changes SHALL be approved by the DOE prior to implementation.

5.2.2 Compliance

The Gamma Irradiation Facility Manager is responsible for ensuring that the requirements of the TSRs for the GIF are met, and SHALL demonstrate compliance by

- Establishing, implementing, and maintaining the required lcos and Administrative Controls (AC), and
- Maintaining required design features.

5.2.3 TSR Violations

Violations of the TSRs occur as the result of

- Entry into a LCO and failure to comply with the applicable Action Statement(s) within the required completion time;
- Failure to perform a Surveillance Requirement (SR) within the required time limit; or
- Failure to comply with an AC statement.

Failure to comply with an AC statement is a TSR violation only when an AC requirement is directly violated (e.g., not meeting a minimum staffing requirement) or the intent of a cited program is not fulfilled (e.g., a significant program deficiency). As long as a cited program is functional and the intent of the program is being fulfilled, violation of specific program details does not constitute a TSR violation.

5.2.4 Response to a TSR Violation

If a violation occurs, the following actions SHALL be taken:

- Notify the DOE, and
- Prepare an occurrence report.

5 ADMINISTRATIVE CONTROLS

5.2.5 Conditions Outside TSRs

Actions may be taken that depart from a requirement in the TSR provided that

- An emergency situation exists and is so declared;
- These actions are needed immediately to protect the public health and safety;
- No action consistent with the tsrs can provide adequate or equivalent protection;
- Action is approved by a qualified operator or on-duty supervisor;
- Verbal notification to doe/kao occurs within 2 hours; and
- A written report is made to the PSO within 24 hours.

Actions in response to immediate hazards take precedence over actions in response to potential hazards.

5.3 MANAGEMENT ORGANIZATION

The general management structure for Gamma Irradiation Facility operations is addressed in Section 17.3.1 of the SAR. Operation of the GIF is the responsibility of SNL's Energy, Information, and Infrastructure Technology Division. Operational authority for the GIF is delegated by the Division Vice-president to the Center Director, Nuclear Energy Technology and to the GIF Manager. Line management is responsible for the health and safety of facility personnel.

5.4 MANAGEMENT RESPONSIBILITIES

Organizational responsibilities for operation of the Gamma Irradiation Facility are discussed in detail in Section 17.3.2 of the SAR.

5.5 PROCEDURES

Procedures/instructions SHALL be established, controlled, implemented, and maintained for activities in support of the TSRs. Such activities may include

- Operations governed by defined modes of facility operation;
- Responses to facility alarms and emergency conditions;
- Surveillances;
- Technical activities in support of operational programs defined herein; and
- Administrative activities governing aspects of facility operation.

A system SHALL be developed to control all procedures/instructions used in support of the TSRs. This system SHALL include document review, approval, revision, and control elements. Temporary changes to procedures/instructions SHALL be made in accordance with the Unreviewed Safety Question process.

5.6 PROGRAMS

The programs addressed in this section SHALL be established, implemented, and maintained. These programs SHALL, as a minimum, meet the requirements specified in the subsections that follow.

5.6.1 Radiation Protection Program

Roles, responsibilities, and requirements for radiation protection of GIF personnel are described in ES&H Manual Supplement MN471016, *Radiological Protection and Procedures Manual*. The Environment, Safety, and Health (ES&H) Center has primary responsibility for the SNL radiation protection program and provides the GIF with Radiological Control Technicians (RCTs) dedicated to GIF operations, and personnel to staff the counting lab in TA-V that supports GIF operations. The radiological control program is described in Chapter 7 of the SAR.

5.6.2 Industrial Safety, Industrial Hygiene, and Fire Protection Programs

Industrial safety, industrial hygiene, and fire protection at the GIF SHALL be implemented by means of SNL ES&H Manual (MN471001), Chapters 4, 6, and 5, respectively. The requirements contained in these chapters are supplemented by requirements contained in the following ES&H Manual Supplements:

- GN470037 - *Lockout/Tagout Procedure for the Control of Hazardous Energy*
- GN470040 - *Operating Forklifts and Motorized Hand Trucks*
- MN471000 - *Pressure Safety Manual*
- MN471004 - *Electrical Safety Manual*
- PG470019 - *SNL/NM Industrial Hygiene Program*

Chapter 5 of the ES&H Manual satisfies the fire protection requirements contained in DOE O 420.1.

5.6.3 Conduct of Operations Program

Conduct of operations at the GIF SHALL be implemented by means of the *Conduct of Operations Manual for Technical Area V (TA-V) Nuclear Facilities*. The broad principles and objective of this manual are that all work be managed with a consistent and auditable set of requirements, standards, and responsibilities that result in improved quality, reliability, and safety of operations. The procedures and instructions contained in this manual address each of the eighteen sections of DOE Order 5480.19, which are addressed in Chapter 11 of the GIF SAR.

5.6.4 Maintenance Program

Maintenance at the GIF SHALL be implemented by means of the SNL Nuclear Facility *Maintenance Implementation Plan (MIP)*. This plan encompasses the requirements of Chapter II of DOE Order 4330.4B that are applicable to nuclear facilities. It addresses administrative, organizational, and implementation requirements, as well as the key functional interfaces with other site organizations that must be established and maintained.

5 ADMINISTRATIVE CONTROLS

The objective of the MIP is to achieve a balance combination of written guidance, personnel skills and supervision to establish and maintain a quality maintenance program to optimize critical system and equipment performance. The major elements of the program are addressed in Chapter 10 of the GIF SAR.

5.6.5 Configuration Management Program

Changes to the GIF configuration SHALL be implemented by means of the *Conduct of Operations Manual for Technical Area V (TA-V) Nuclear Facilities* and GN470080, *Implementing the Unreviewed Safety Question (USQ) Process for Nuclear Facilities*. The Conduct of Operations Manual specifies the roles, responsibilities, and procedures for ensuring that any changes to the GIF configuration receive appropriate safety and compliance reviews and proper management authorization. The SNL USQ process (GN470080) ensures that proposed configuration changes satisfy the requirements of DOE Order 5480.21.

5.6.6 Criticality Safety Program

The nuclear criticality safety program at the GIF SHALL be implemented in accordance with ES&H Manual Supplement GN470072, *Nuclear Criticality Safety*. This ES&H Manual supplement satisfies the nuclear criticality safety requirements of DOE O 420.1, which in turn incorporates the requirements of the ANSI/ANS nuclear criticality safety standards. The criticality safety program is addressed in Chapter 6 of the GIF SAR.

5.6.7 Emergency Preparedness Program

Emergency preparedness at the GIF SHALL be assured by implementation of the *TA-V Emergency Preparedness Plan* and the *SNL Emergency Preparedness Plan* (PN471011). The TA-V plan is an initial response plan that performs an initial assessment of the nuclear facilities. The integrated command of the *SNL Emergency Preparedness Plan* provides overall response to an incident. The emergency preparedness program is addressed in Chapter 15 of the GIF SAR.

5.6.8 Quality Assurance Program

Quality assurance at the GIF SHALL be implemented by means of the *Sandia Research Reactor and Experimental Programs (RREP) Quality Assurance Program Plan (QAPP)*. The RREP-QAPP addresses the quality assurance program requirements of both DOE O 414.1A and 10 CFR 830.120 as they apply to the GIF. The RREP is discussed in Chapter 14 of the SAR.

5.7 MINIMUM OPERATIONS SHIFT COMPLEMENT

Unmanned irradiation operations are allowed in the GIF. A GIF-qualified operator is required to perform operations in the pool or to raise an elevator with sources into a cell. An SNL-qualified radiological control technician (RCT) SHALL be present whenever sealed sources are moved in the pool (other than being raised into a cell on the cell elevator). A GIF-qualified supervisor and an SNL-qualified RCT SHALL be available within TA-V to support manned GIF operations.

5 ADMINISTRATIVE CONTROLS

Facility staffing and limitations on overtime for GIF personnel SHALL be managed in accordance with the TA-V Conduct of Operations Manual, which is addressed in Chapter 11 of the GIF SAR.

5.8 OPERATING SUPPORT

The operations staff may be supplemented by additional technical personnel. A list of operations personnel with their work and home telephone numbers SHALL be posted in the GIF operations center.

5.9 STAFF QUALIFICATIONS AND TRAINING

Entry-level requirements for Gamma Irradiation Facility operating personnel are intended to assure that these personnel have the knowledge, skills, and abilities to operate and maintain the GIF. This includes operating and maintaining related support systems and equipment in a safe and reliable manner under all conditions. The minimum education and experience requirements for Manager, Facility Supervisor, GIF Operator, technical support staff and technicians are provided in the *Training Implementation Matrix for the Technical Area V Nuclear Facilities*.

The Facility Supervisor and GIF Operators are qualified positions requiring successful completion of a formal training program before an individual is allowed to operate specific GIF equipment and/or controls unsupervised. Proficiency for the qualified positions is demonstrated by minimum acceptable scores on written tests and by observation of the individual's operating skill with GIF systems and equipment. Qualification also requires demonstrated adherence to conduct of operations principles, ability to follow procedures, and commitment to cultivating an environment of teamwork and continuous improvement.

5.10 EXPERIMENT SAFETY

Operational concerns associated with the conduct of an EXPERIMENT are limitations on quantities of explosives and HAZARDOUS MATERIALS. To ensure adequate review of the hazards of experiments an experiment plan SHALL be prepared for all EXPERIMENTS (or types of EXPERIMENTS) that are not directly covered in operating procedures. The EXPERIMENT, as detailed in the experiment plan, is reviewed as specified in Section 5.12.

Materials or energy storing systems that could release energy in a sudden explosive manner, and that have destructive potential, SHALL be treated as explosives. SINGLE CONTAINMENT SHALL be required, as a minimum, for EXPERIMENTS containing:

- explosive material;
- materials considered to be severe toxicity hazards; and
- highly flammable materials that could be released and ignited.

SINGLE CONTAINMENT devices SHALL be designed with a minimum pressure safety factor of two. In the case of explosives, SINGLE CONTAINMENT devices SHALL be capable of withstanding detonation of at least twice the amount of explosives to be irradiated without rupture. The containment for explosives may be vented.

5 ADMINISTRATIVE CONTROLS

DOUBLE CONTAINMENT SHALL be required for experiments containing isotopes of plutonium unless a safety evaluation shows that credible EXPERIMENT failures do not produce doses at the Exclusion Area Boundary greater than that specified in the GIF authorization basis, in which case SINGLE CONTAINMENT may be used. DOUBLE CONTAINMENT devices SHALL be designed such that 1) each container meets the requirements of SINGLE CONTAINMENT, and 2) no single internal event will result in the loss of integrity of both containers.

Fissile material and explosives SHALL not be tested together in the GIF.

5.11 TSR BASES CONTROL

Changes to the TSR Bases SHALL NOT be made without prior DOE approval if the changes involve any of the following:

- A change in the TSR;
- A change to the SAR that involves an Unreviewed Safety Question as defined in DOE Order 5480.21; or
- A change to the way that OPERABILITY or the TSR could be met, applied, or interpreted.

5.12 REVIEW/AUDITS

Primary responsibility for review of day-to-day activities SHALL be with the GIF Supervisor and the GIF Department Manager. Procedures written by the GIF organization and approved by line management implement the conduct of operations review principles as prescribed in the *Conduct of Operations Manual for Technical Area V (TA-V) Nuclear Facilities*. These procedures address all aspects of safe operation, configuration control, review and approvals, assignment and transfer of responsibilities, and performance assessment by management.

The Sandia Independent Review and Appraisal System (SIRAS) has been established to provide enhanced safety in nuclear facility operations and to ensure compliance with DOE orders. As part of the SIRAS, two safety committees – the Nuclear Facilities Safety Committee (NFSC) and the TA-V Radiological and Criticality Safety Committee (RCSC) – are established and maintained for the purpose of advising line management on safety matters relating to operational activities at the GIF.

The NFSC is chartered by and directly responsible to the Vice-president with line responsibility for the TA-V nuclear facilities (Organization 6000 - Energy, Information, and Infrastructure Surety). The NFSC acts in an advisory capacity to the line director responsible for the nuclear facilities. The RCSC is authorized to make recommendations to line management regarding the safety of matters that satisfy general criteria that have been reviewed by the NFSC and are delineated in the RCSC charter.

The RCSC is the basic internal safety review committee for GIF activities, providing an independent safety review of proposed activities and facility modifications. The committee acts in an advisory capacity to line management and performs the following activities as set forth in an

5 ADMINISTRATIVE CONTROLS

operational committee charter approved by the chairman of the NFSC whose members are appointed by the SNL Deputy Director, Nuclear Facility Operations:

- Reviews proposed modifications to the facility and its procedures;
- Reviews applicable experiment plans;
- Conducts detailed technical reviews of safety analysis documents and unreviewed safety question safety evaluations; and
- Performs an annual review of gif operations involving radiological and criticality safety.

RCSC reviews help to ensure that GIF operations are based on sound engineering principles and are maintained within the approved TSR.

5.13 REPORTING REQUIREMENTS

Abnormal events/occurrences SHALL be investigated, reported, and corrective action taken in accordance with Chapter 18 of the SNL ES&H Manual.

5.14 OTHER WORKER SAFETY CONTROLS

5.14.1 Radiation Monitoring System

Operation of the radiation monitoring system is assured via compliance with the Radiological Protection Procedures Manual and implementation of the SNL Radiation Protection Program. In accordance with this program, at least one radiation area monitor (RAM) SHALL be OPERATING in any area of the GIF where significant quantities of radioactive material are stored or otherwise handled by workers. This equipment SHALL be operating at all times, except for short periods of routine maintenance. RAMs SHALL be checked periodically to verify operability and calibrated (not less than annually) to ensure set points are maintained.

A portable radiation monitoring instrument SHALL be used to check for sealed source radiation in a cell upon the first cell entry following MODE 1 operation.

5.14.2 Radioactive and Fissile Material Limits

The total non-sealed source radioactive material inventory SHALL be limited to less than the Hazard Category 2 thresholds of DOE-STD-1027-92 to ensure that a dose of 9 mrem at 3000 meters is not exceeded in the most bounding radiological accident scenario --- an unmitigated facility fire.

Sealed source radioactive material inventories in the irradiation cells and the source storage pool SHALL be limited such that the dose rate in continuously occupied areas of the GIF does not exceed an average of 0.5 mR/hr in accordance with the as-low-as-reasonably-achievable (ALARA) objectives of the SNL Radiological Protection Procedures Manual. Dose rates may exceed this average value in areas of the facility that are not continuously occupied. In addition, the radioactive material inventory in the source storage pool SHALL be limited such that the bulk pool water temperature does not exceed 60 °C to protect pool water polishing bed resins.

5 ADMINISTRATIVE CONTROLS

Radioactive material located in the GIF floor storage vault SHALL be limited to less than Hazard Category 3 thresholds in accordance with DOE-STD-1027.

Gaseous and liquid radioactive materials in excess of Hazard Category 3 thresholds SHALL not be handled or stored in the GIF, unless contained in a DOT Type B container, since there is no provision for filtering a release of such material in the event of an accident.

Fissile material limits will be in accordance with activity-specific criticality safety assessments. In addition, to preclude inadvertent accumulations of fissile material, generic limits of 350 grams U-235 and 225 grams Pu-239 SHALL be observed for any unposted, unanalyzed location in the GIF. These limits are based on guidance provided in SNL ES&H Manual Supplement GN470072, *Nuclear Criticality Safety*. Fissile material SHALL not be placed in the GIF source storage pool.

5.14.3 Combustible and Flammable Material Limits

As a good practice, only small quantities of combustible and flammable materials SHALL be stored or used in the GIF in order to minimize the likelihood and/or severity of a fire or explosion and to keep worker exposure to chemicals ALARA. Chapter 2 of the TA-V Conduct of Operations Manual addresses the specific activities to be conducted in conjunction with operator inspection tours of TA-V nuclear facilities. Combustible and flammable material will be handled in accordance with SNL ES&H Manual Chapter 5 guidance. In addition, the following guidelines will be observed for experiments:

- If radioactive and explosive or flammable materials are combined in an experiment, then the experiment plan SHALL be reviewed in accordance with Section 5.12.
- Flammable materials in an experiment SHALL be limited to no more than one liter of flammable liquid and SHALL be contained as required in Section 5.10.

Flammable material entering the large cell in a motor vehicle's fuel tank SHALL be excluded from these guidelines as a result of the safety features built into the vehicle's fuel system.

5.14.4 Sealed Sources

A source storage pool water sample SHALL be analyzed on a semi-annual basis for evidence of damaged irradiation sources in accordance with the sealed source leak detection requirements of the SNL RPPM. Integrity of the sealed sources will be administratively controlled by maintaining pool water resistivity at greater than 0.1 megohms-cm in accordance with ANS N43.10-1984. Water resistivity SHALL not be less than 0.1 megohms-cm for a period exceeding 250 hours.

5.14.5 Irradiation Cell Shielding

The total irradiation source activity allowed in an irradiation cell SHALL be limited so that personnel radiation exposure levels in continuously occupied areas of the facility are below an average of 0.5 mrem per hour (see Section 5.14.2). Radiation surveys SHALL be conducted to verify the radiation shielding integrity of the cell structures following any modification to the cell structure or removal and replacement of cell windows or penetration shield plugs.

5 ADMINISTRATIVE CONTROLS

5.14.6 Source Transfer Cask

Operations involving the source transfer cask SHALL be administratively controlled (by procedure) to ensure that the cask lid is secured prior to cask movement following insertion of sealed sources. Administrative radiological protection controls SHALL be implemented to ensure that worker radiation exposures are kept as low as reasonably achievable (ALARA) during source transfer activities.

5.14.7 Source Storage Pool Water Level

The source storage pool water level SHALL be administratively monitored on a daily basis to ensure that workers are adequately protected from exposure to radiation sources in the pool.

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APPENDIX A

BASES

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2.0 SAFETY LIMITS (SL)

There are no safety limits applicable to Gamma Irradiation Facility (GIF) operations.

3.0 GENERIC LIMITING CONDITIONS FOR OPERATION (LCOs)

LCOs 3.0.1 through 3.0.7 establish the general requirements applicable to all LCOs at all times, unless otherwise stated.

LCO 3.0.1 LCO 3.0.1 establishes the MODE applicability statement within each LCO as the requirement for conformance to the LCO for safe operation of the facility. The ACTIONS establish the remedial measures that must be taken within specified completion times when the requirements of an LCO are not met as required by LCO 3.0.2.

LCO 3.0.2 LCO 3.0.2 establishes that, on discovery of a failure to meet an LCO, the associated ACTIONS SHALL be met. The completion time of each ACTION is applicable from the time that a condition is entered. The ACTIONS establish those remedial measures that SHALL be taken within specified completion times when the requirements of an LCO are not met.

This LCO establishes that

- completion of the ACTIONS within the specified completion time constitutes compliance with an LCO, and
- completion of the ACTIONS is not required when an LCO is met within the specified completion time, unless otherwise specified.

Whether stated as an ACTION or not, restoration of inoperable equipment or a condition back to within limits is an action that may always be considered on entering ACTIONS.

The completion times of the ACTIONS are also applicable when a system or component is intentionally removed from service.

When a change in MODE or other specified condition is required to comply with ACTIONS, the facility may enter a MODE or other specified condition in which a new LCO becomes applicable. In this case, the completion times of the associated ACTIONS would apply from the point in time that the new LCO becomes applicable, and the condition(s) is entered.

LCO 3.0.3 LCO 3.0.3 establishes the ACTIONS that SHALL be implemented when an LCO is not met.

1. Associated ACTIONS and completion times are not met and no other condition applies.
2. The condition of the facility is not specifically addressed by the associated ACTIONS.

This LCO delineates a time of 1 hour for initiating ACTIONS to place the facility in MODE 2, which is a safe mode since all of the sealed sources are located at the bottom of the source storage pool.

Upon entry into LCO 3.0.3, 1 hour is allowed to prepare for an orderly change in facility operation.

LCO 3.0.4 LCO 3.0.4 establishes limitations on changes in MODES or other specified conditions in the applicability statement when an LCO is not met. It precludes placing the facility in a different MODE or other specified condition when the following exists:

1. the requirements of an LCO in the MODE or other specified condition to be entered are not met, or
2. continued non-compliance with these requirements would result in requiring that the facility be placed in a MODE or other specified condition in which the LCO does not apply to comply with the ACTIONS.

Compliance with ACTIONS that permit continued operation of the facility for an unlimited period of time in an applicable MODE or other specified condition provides an adequate level of safety for continued operation.

The provisions of LCO 3.0.4 SHALL not prevent changes in MODES or other specified conditions in the applicability statement that are required to comply with ACTIONS. When changing MODES or other specified conditions while in a condition (in compliance with LCO 3.0.4 or where an exception to LCO 3.0.4 is stated), the ACTIONS define the remedial measures that apply.

Surveillances do not have to be performed on the associated inoperable equipment, as permitted by SR 4.0.1. Therefore, a change in MODE or other specified conditions in this situation does not violate SR 4.0.1 or 4.0.4 for those surveillances that do not have to be performed because of the associated inoperable equipment. However, SRs SHALL be met to demonstrate OPERABILITY before declaring the associated equipment OPERABLE and restoring compliance with the affected LCO.

LCO 3.0.5 LCO 3.0.5 establishes the allowance of restoring equipment to service under ACs when it has been removed from service or declared inoperable to comply with ACTIONS. The sole purpose of this LCO is to provide an exception to LCO 3.0.2 to allow the performance of SRs to demonstrate the following:

1. OPERABILITY of the equipment being returned to service and
2. OPERABILITY of other equipment.

The ACs are to ensure the time the equipment is returned to service in conflict with the requirements of the ACTIONS is limited to the time absolutely necessary to perform the allowed SR. This LCO does not provide time to perform any other preventive or corrective maintenance.

LCO 3.0.6 LCO 3.0.6 establishes an exception to LCO 3.0.2 for support systems that have an LCO specified in the TSRs. This exception is necessary because LCO 3.0.2 would require that the conditions and ACTIONS of the associated inoperable supported system LCO be entered solely from the inoperability of the support system.

When a support system is inoperable and there is an LCO specified for it in the TSRs, the supported system(s) is not required to be declared inoperable as a result of the support system inoperability.

When a support system is inoperable and there is no LCO specified for it, the impact of the degradation of the support-system function on the OPERABILITY of its supported system SHALL be evaluated. The degradation of the support system may or may not affect the OPERABILITY of the supported system. OPERABILITY of the supported system SHALL depend on the intended function of the supported system and the level of support that the supported system provides.

LCO 3.0.7 LCO 3.0.7 provides for operations required to complete one or more Surveillance Requirements (SR) for the specific cases of initial commencement of operations or commencement of operations following extended shutdowns. In both cases, operation may be required to enable measurement of the operating parameters necessary to establish compliance with the SRs. During these specific cases, the operation is performed under administrative controls (plans and procedures) that direct the operations and provide for appropriate compensatory actions for any unsatisfied SRs. The compensatory actions may include (as applicable):

- A prediction of LCO compliance using numeric calculation, measurements from previous identical operations, or extrapolations from similar conditions;
- A process to establish compliance with the SR in a safe, methodical approach as soon as conditions exist for measuring the appropriate parameters;
- Reliance on instrumentation that is known to be in calibration or has been compensated to provide conservative indications;
- Additional instrumentation to provide supporting measurements of affected LCS/lcos; and
- Adjustments of instrumentation trip settings to conservative values to account for additional uncertainty in measured parameters.

4.0 GENERIC SURVEILLANCE REQUIREMENTS (SR)

SRs 4.0.1 through 4.0.5 establish the general requirements applicable to all SRs and apply at all times, unless otherwise stated.

SR 4.0.1 SR 4.0.1 establishes the requirement that SRs SHALL be met during the MODES or other specified conditions in the applicability statement for which the requirements of the LCO apply, unless otherwise specified in the individual SRs. This SR ensures that surveillances are performed to verify the OPERABILITY of

systems and components and that variables are within specified limits. Failure to meet a surveillance within the specified frequency, in accordance with SR 4.0.2 constitutes a failure to meet an LCO.

Systems and components are assumed to be OPERABLE when the associated SRs have been met. Nothing in this SR, however, is to be construed as implying that systems or components are OPERABLE when

1. the systems or components are known to be inoperable, although still meeting the SRs, or
2. the requirements of the surveillance(s) are known not to be met between required surveillance performances.

Surveillances do not have to be performed when the facility is in a MODE or other specified condition for which the requirements of the associated LCO are not applicable, unless otherwise specified.

Surveillances, including surveillances invoked by ACTIONS, do not have to be performed on inoperable equipment because the ACTIONS define the remedial measures that apply. SRs have to be met in accordance with SR 4.0.2 before returning equipment to OPERABLE status.

Upon completion of maintenance, appropriate post-maintenance testing is required to declare equipment OPERABLE. Post-maintenance testing may not be possible in the current MODE or other specified conditions in the applicability statement because the necessary facility parameters were not established. In these situations, the equipment may be considered OPERABLE, provided that testing has been satisfactorily completed to the extent possible and that the equipment is not otherwise believed to be incapable of performing its function. This SHALL allow operation to proceed to a MODE or other specified condition where other necessary post-maintenance tests can be completed.

SR 4.0.2 SR 4.0.2 establishes the requirements for meeting the specified frequency for surveillances and any ACTION with a completion time that requires the periodic performance of the ACTION on a “once every ...” interval.

SR 4.0.2 permits a 25% extension of the interval specified in the frequency. This facilitates surveillance scheduling and considers facility operating conditions that may not be suitable for conducting the surveillance. The 25% extension does not significantly degrade the reliability that results from performing the surveillance at its specified frequency.

The provisions of SR 4.0.2 are not intended to be used repeatedly as an operational convenience to extend surveillance intervals or periodic completion time intervals beyond those specified.

SR 4.0.3 SR 4.0.3 establishes the flexibility to defer declaring affected equipment inoperable when a surveillance has not been completed within the specified frequency. A delay period of up to 24 hours applies from the time it is discovered

that the surveillance has not been performed, in accordance with SR 4.0.2, and not at the time the specified frequency was not met.

This delay period provides an adequate time limit to complete missed surveillances. This delay period permits the completion of a surveillance before compliance with ACTIONS or other remedial measures would be required that may preclude completion of the surveillance.

When a surveillance with a frequency, based not on time intervals but on specified facility conditions or operational situations, is discovered not to have been performed when specified, SR 4.0.3 allows the full 24-hour delay period in which to perform the surveillance.

The provisions of SR 4.0.3 also provide a time limit for completion of surveillances that become applicable as a consequence of MODE changes imposed by ACTIONS.

If a surveillance is not completed within the allowed delay period, the equipment is considered inoperable. The completion times of the ACTIONS for the applicable conditions begin IMMEDIATELY on expiration of the delay period. If a surveillance is failed within the delay period, the equipment is inoperable. The completion times of the ACTIONS for the applicable conditions begin IMMEDIATELY on the failure of the surveillance.

Completion of the surveillance within the delay period allowed by this SR or within the completion time of the ACTIONS restores compliance with SR 4.0.1.

SR 4.0.4 SR 4.0.4 establishes the requirement that all applicable SRs SHALL be met before entry into a MODE or other specified condition in the applicability statement.

The provisions of SR 4.0.4 SHALL not prevent changes in MODES or other specified conditions in the applicability statement that are required to comply with ACTIONS.

The precise requirements for performance of SRs are specified such that exceptions to SR 4.0.4 are not necessary. The specific time frames and conditions necessary for meeting the SRs in accordance with the requirements of SR 4.0.4 are specified in the frequency, in the surveillance, or both. This allows performance of surveillances when the prerequisite condition(s) specified in a surveillance procedure require entry into the MODE or other specified condition in the applicability statement of the associated LCO before the performance or completion of a surveillance. A surveillance (which could not be performed until after entering the LCO applicability) would have its frequency specified such that it is not “due” until the specific conditions needed are met.

SR 4.0.5 SR 4.0.5 provides for operations required to complete one or more SRs for the specific cases of initial commencement of operations or commencement of

operations following extended shutdowns. During these specific cases, the operation is performed under administrative controls (plans and procedures) that direct the operations and provide for appropriate compensatory actions for any unsatisfied SRs.

3/4.1 LIMITING CONTROL SETTINGS (LCS)

Since there are no safety limits applicable to Gamma Irradiation Facility (GIF) operations, there are also no applicable limiting control settings.

3/4.2 LIMITING CONDITIONS FOR OPERATION (LCO)

3/4.2.1 Cell Source Elevator Power Interrupt Circuit

BACKGROUND The source elevator power interrupt circuit is a hard-wired feature that protects facility workers entering a cell from potentially lethal exposure to the irradiation sources on the cell elevator. The active SSCs for each cell include two safety switches (per elevator) that are physically mounted on the cell door frame, and an emergency stop switch on the cell operations console. The safety switches are closed when the door is closed and opened when the door is opened. When the cell door is opened one safety switch de-energizes the source elevator brake, while the other safety switch de-energizes the source elevator motor contactor. (For the large cell, there is a set of safety switches for each cell elevator.) The emergency stop switch on each operations console de-energizes both the source elevator brake and motor contactor. De-energizing the elevator brake and motor contactor causes the elevator to descend by gravity to the bottom of the source storage pool.

The large cell also includes a moveable shield wall for accessing the cell with test items that are too large to bring through the entry maze. This cell contains two additional safety switches that are mounted on the stationary mating cell wall and actuated by the opening and closing of the moveable wall. One safety switch de-energizes both large cell source elevator brakes, while the other safety switch de-energizes both source elevator motor contactors.

Normal electrical power is supplied for this circuit through the Cell Control Subsystem (CCS).

LCO This LCO requires the source elevator power interrupt circuit for each cell to be OPERABLE.

APPLICABILITY The cell source elevator power interrupt circuit is required to be OPERABLE in MODE 1.

ACTIONS These actions ensure that the source elevator power interrupt circuit is restored to OPERABLE prior to entering MODE 1. Inoperability of a safety switch represents a condition wherein the switch does not

mechanically open when the closing force is removed. Since these switches are spring actuated to open, this condition would most likely result from a broken spring. Restoring the switch to OPERABLE would then be accomplished by replacement of the spring or the entire switch mechanism.

Inoperability of the emergency stop switch represents a condition wherein the switch does not mechanically open when the button on the operations console is depressed. This condition would most likely result from binding of the switch contacts. Restoring the switch to OPERABLE would then be accomplished by replacement of the switch and associated contacts.

SURVEILLANCE REQUIREMENTS

- SR 4.2.1.1 This surveillance verifies that electrical power to the cell source elevator electric brake is interrupted when the appropriate cell door safety switch is opened. Performing this surveillance semi-annually provides adequate assurance that the switch is functioning properly without unnecessarily impacting normal cell irradiation operations.

- SR 4.2.1.2 This surveillance verifies that electrical power to the cell source elevator motor contactor is interrupted when the appropriate cell door safety switch is opened. Performing this surveillance semi-annually provides adequate assurance that the switch is functioning properly without unnecessarily impacting normal cell irradiation operations.

- SR 4.2.1.3 This surveillance verifies that electrical power to the cell source elevator electric brake is interrupted when the emergency stop switch on the cell operations console is actuated. Performing this surveillance semi-annually provides adequate assurance that the switch is functioning properly without unnecessarily impacting normal cell irradiation operations.

- SR 4.2.1.4 This surveillance verifies that electrical power to the cell source elevator motor contactor is interrupted when the emergency stop switch on the cell operations console is actuated. Performing this surveillance semi-annually provides adequate assurance that the switch is functioning properly without unnecessarily impacting normal cell irradiation operations.

- SR 4.2.1.5 This surveillance verifies that electrical power to the cell source elevator electric brake is interrupted when the emergency stop switch on the cell operations console is actuated with the cell elevator bypass switch on. Performing this surveillance semi-annually provides adequate assurance that the switch is functioning properly without unnecessarily impacting normal cell irradiation operations.

- SR 4.2.1.6 This surveillance verifies that electrical power to the cell source elevator motor contactor is interrupted when the emergency stop switch on the cell operations console is actuated with the cell elevator bypass switch on. Performing this surveillance semi-annually provides adequate assurance that the switch is

functioning properly without unnecessarily impacting normal cell irradiation operations.

- SR 4.2.1.7 This surveillance verifies that electrical power to the large cell source elevator electric brakes is interrupted when the appropriate moveable wall safety switch is opened. Performing this surveillance semi-annually provides adequate assurance that the switch is functioning properly without unnecessarily impacting normal cell irradiation operations.
- SR 4.2.1.8 This surveillance verifies that electrical power to the large cell source elevator motor contactors is interrupted when the appropriate moveable wall safety switch is opened. Performing this surveillance semi-annually provides adequate assurance that the switch is functioning properly without unnecessarily impacting normal cell irradiation operations.
- SR 4.2.1.9 This surveillance verifies that electrical power to the large cell source elevator electric brakes is interrupted when the emergency stop switch on the moveable wall control console is actuated. Performing this surveillance semi-annually provides adequate assurance that the switch is functioning properly without unnecessarily impacting normal cell irradiation operations.
- SR 4.2.1.10 This surveillance verifies that electrical power to the large cell source elevator motor contactors is interrupted when the emergency stop switch on the moveable wall control console is actuated. Performing this surveillance semi-annually provides adequate assurance that the switch is functioning properly without unnecessarily impacting normal cell irradiation operations.
- SR 4.2.1.11 This surveillance verifies that electrical power to the large cell source elevator electric brakes is interrupted when the emergency stop switch on the moveable wall control console is actuated with the cell elevator bypass switch on. Performing this surveillance semi-annually provides adequate assurance that the switch is functioning properly without unnecessarily impacting normal cell irradiation operations.
- SR 4.2.1.12 This surveillance verifies that electrical power to the large cell source elevator motor contactors is interrupted when the emergency stop switch on the moveable wall control console is actuated with the cell elevator bypass switch on. Performing this surveillance semi-annually provides adequate assurance that the switch is functioning properly without unnecessarily impacting normal cell irradiation operations.
- SR 4.2.1.13 This surveillance verifies that following removal of electrical power from the cell source elevator brake and motor contactor the elevator descends to the bottom of the source storage pool. Performing this surveillance semi-annually provides adequate assurance that the elevator performs properly in response to activation of the elevator power interrupt circuit, without unnecessarily impacting normal cell irradiation operations.

3/4.2.2 Cell Radiation Area Monitor

BACKGROUND The cell RAM provides a visual radiation warning signal to workers entering the cell with a radioactive source in the cell. Each cell RAM goes into an alarm condition when one or more sealed sources are raised into the cell on the source elevator (the alarm setpoint will be no higher than 100 mR/hr). The alarm condition drives a rotating red beacon in the cell entrance maze warning anyone entering the maze of a radiological hazard.

LCO This LCO requires the cell RAM and its associated visual alarm to be OPERABLE.

APPLICABILITY The cell RAM and associated visual alarm are required to be OPERABLE in MODES 1 and 2.

ACTIONS These actions ensure that the cell RAM and the visual alarm are restored to OPERABLE prior to facility operation in MODE 1 or before personnel entry in MODE 2. Inoperability of the RAM represents a condition wherein the RAM does not alarm when its setpoint is exceeded. This condition would most likely be the result of an internal part failure. Inoperability of the visual alarm (beacon) represents a condition wherein the beacon does not function. This condition would most likely be the result of either a burned out bulb or a RAM failure. Each cell RAM is connected to an uninterruptible power supply so that it will continue to perform its safety function for a minimum of two hours in the event of a loss of normal power. Restoring an inoperable cell RAM to OPERABLE may be accomplished by either repair or replacement.

SURVEILLANCE REQUIREMENTS

SR 4.2.2.1 This surveillance verifies the OPERABILITY of the cell RAM and its associated visual alarm prior to allowing personnel to enter the cell. Performing this surveillance prior to the first cell entry of the day provides adequate assurance that the RAM is functioning properly.

SR 4.2.2.2 This surveillance verifies that the cell RAM alarms visually at its setpoint, which will be no higher than 100 mR/hr. Performing this surveillance once a quarter is deemed to be an acceptable trade-off between the risk that the setpoint may drift higher than desired and ALARA considerations associated with personnel exposure to the radiation check source.

SR 4.2.2.3 CALIBRATION of the RAM is required to ensure that the monitor goes into an alarm condition when a radiation field equal to or larger than the alarm setpoint is sensed. Calibration of RAMs on an annual basis is standard practice under the SNL radiation protection program.

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APPENDIX B
DESIGN FEATURES

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The Gamma Irradiation Facility relies on the design features listed below to either preclude or reduce the potential consequences of design basis accidents.

- Irradiation source stainless steel capsule
- In-cell source irradiation fixtures
- Irradiation cell radiation shielding (walls, roof, and penetration shield plugs)
- Serpentine and stepped cell penetrations
- Shielding windows
- Source storage pool and liner
- Source transfer shield cask
- Distance to the exclusion area boundary
- Source storage pool water temperature limit of 60° C with only natural cooling limits storage pool source inventory to the equivalent of 1.5 MCi of Co-60 or ~43 kW of radioactive decay-generated heat.

These features are described in detail in the Gamma Irradiation Facility Safety Analysis Report and therefore will not be elaborated on here other than to note that they SHALL NOT be modified without a thorough review by the manager and the facility safety committee to determine that their overall effectiveness will not be degraded by any proposed changes.

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1	0720	R. L. Hunter, 6804
1	0748	D. S. Oscar, 6415
1	1091	P. R. Fleming, 3111
1	1374	K. R. Bolt, 5327
1	1141	F. T. Antonich, 6433
1	1141	R. A. Knief, 6433
1	1141	R. E. Naegel, 6433
10	1141	T. E. Vanderbeek, 6433
1	1141	S. A. Walker, 6433
2	1143	D. T. Berry, 6432
1	1143	Z. R. Lawson, 6432
1	1143	N. F. Schwerts, 6433
1	1143	R. F. Seylar, 6432
1	1145	D. W. Vehar, 6432
1	1145	J. F. Loye, 6430
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2	0899	Technical Library, 9616
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